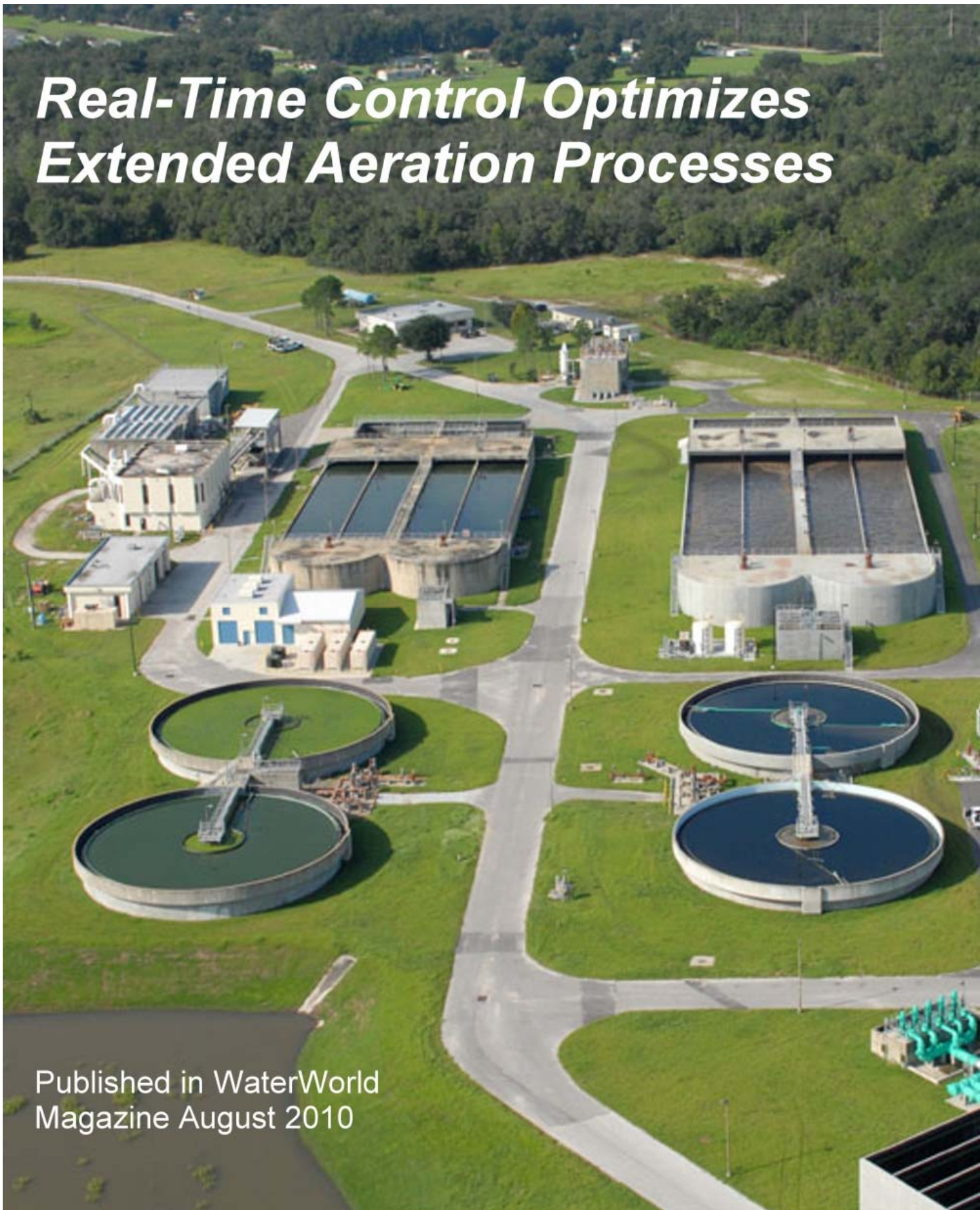


Real-Time Control Optimizes Extended Aeration Processes



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By Dave Marsh

The population of Hillsborough County, Florida has doubled since the Valrico advanced wastewater treatment plant (AWTP) was built in 1990 to treat the sewage of several small communities west of the City of Tampa. When it began operation, the Valrico AWTP capacity was only 4 MGD; small when compared to Tampa's 96 MGD Howard F. Curren AWTP located not far to the east. But Valrico serves as a very important link in the chain of WWTPs treating the county's sewage while protecting Florida's fragile coastal waters.

The Valrico AWTP has been expanded several times over the past 20 years to accommodate the county's steadily growing population and it is now rated at 12 MGD. Today plant management focuses on making its processes as efficient as possible to optimize current capacity and handle the peak loads that would otherwise prove challenging.

Valrico is an extended aeration AWTP in which both nitrification and denitrification processes occur continuously in the same aeration basin. Optimizing both BNR (Biological Nutrient Removal) processes in the same basin can only be achieved by tightly controlling aeration to maintain the appropriate balance of oxygen rich and oxygen deficient environments. Valrico has two of these nitrification/denitrification basins. Surface aerators in both of them are controlled with real-time information from a single ChemScan Online Process Analyzer, manufactured by ASA Analytics.

"Our ultimate goal of using the ChemScan Analyzer is better monitoring to keep up with the process," said Kevin Grant, Valrico Plant

Manager. "We expanded the plant to 12 MGD, but we're not operating at that level yet. We're closer to 6 MGD. But sometimes our flows come in at 9 to 10 MGD, and during the weekends we can reach continuous flow rates of 10 MGD all day long. So the ultimate goal for me is to run a more efficient process with better process control."



Nitrification and denitrification processes occur in the same basins requiring precise aeration control that maintains the appropriate balance of rich and oxygen deficient environments.

The Valrico process begins in an anoxic zone where raw sewage is mixed with RAS (Returned Activated Sludge) and phosphorus is biologically removed. The mixed liquor then enters one of two large oval aeration basins where surface aerators operate at a constant speed 100% of the time. It flows through the basin to a second set of surface aerators controlled by the online ChemScan Analyzer. Samples are automatically drawn at the two weirs where the sludge exits to the clarifiers and the analyzer tests them for levels of Nitrates (NO₃) and Ammonia (NH₃). Depending on the results, the analyzer sends control signals via the SCADA to either increase or decrease the speed of the surface aerators.

"Before we had access to real-time information on our processes, our operators relied on their experience and educated guesses to adjust the process," said Grant.

ASA CASE STUDY

“To change the speed of our aerators, we literally had to leave the operations building and climb on top of our aerators or go to a motor control center to increase or lower the speed. But online monitoring and real-time control has removed the guesswork from optimizing our nitrification and denitrification processes. Now the ChemScan automatically collects and tests the samples and then adjusts the aerators accordingly. It’s all automatic and provides more precise control of our nitrification and denitrification processes.”



Prior to installing ChemScan online process analyzers, operators manually adjusted blower speed at the control boxes located near the aeration basins.

Valrico’s analyzer tests samples for specific chemicals using fully automated UV-Visible spectrometry to measure absorbance levels across 256 wavelengths of ultraviolet and visible light. A single ChemScan Process Analyzer can monitor up to eight sample points, detecting Ammonia, Nitrite and Nitrate as individual parameters from multiple process sample points or basins.

At the Valrico AWTP a Nitrate sample reading that exceeds the analyzer set-point results in an automatic reduction of aerator speed. And conversely, aerator speed is immediately increased when a sample reading for Ammonia exceeds the analyzer set point.

Real-time data provides the Valrico operators with current information and the confidence to adjust the process even during times of significant change in influent flow levels. They can manually increase the speed of the aerators via the SCADA system in anticipation of peak flows or lower speeds to avoid over aeration when effluent flows significantly drop during early morning hours.

Valrico’s analyzer has provided reliable performance with minimal routine maintenance. It’s larger sample collection tubes have proven to be resistant to plugging. Although ASA Analytics recommends using a ChemScan On-line Ultrafilter for samples drawn from aeration basins, the Valrico plant installed individual grinder pumps on each sample line and has not had issues with line plugging.

Grant says the Valrico Plant would be designed differently today if it were being built as a new plant, but upgrading to online process control has helped his operators get the most out of the plant.

“Improving the efficiency of our aeration basins is the key to maximizing our operating capacity and having access to real-time information on our processes has been fundamental to this,” he said.

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